APPENDIX I

VEGETATION SURVEY

Baseline Description of

a

Native Sagebrush/Grass Reference Area

at

Wildcat Loadout
(PR 007/033)
NW 1/4 SE 1/4, T. 13 S., R. 9 E.
Carbon County, Utah

for

Andalex Resources, Inc.
P.O. Box 902
Price, Utah 84501

by

Nicholas S. Van Pelt*

August 16, 1988

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*Currently temporary research assistant, Dept. of Range Science, Utah State University, Logan 84322-5230; (801) 750-2100, 750-2471. He holds a doctoral degree (1988) in range ecology from the same institution, and specializes in inventory and management problems of pinyon pine-juniper woodlands. His dissertation research was conducted at sites 4 miles west of the location reported herein, and at additional, long-term sites elsewhere in Carbon County.

All fieldwork and analysis was performed by the author. No work connected with this report was done on Utah State University time, nor with USU vehicles.

Introduction

This report is based on a one-day (August 15, 1988) visit to a reference area identified by Andalex and the Division of Oil, Gas, and Mining (hereinafter DOGM) on public (BLM) land 100 yards west of the southern coal stockpile. Work consisted of establishing a measured area perimeter marked at four corners, qualitatively describing the features of the site, obtaining voucher plant specimens, and estimating plant and surficial cover, shrub density, and mean shrub height. Since the area is for reference purposes, no productivity estimates were required from this initial description (DOGM, 1982). However, the recently-published soil survey for the area (Jensen and Borchert 1988) was consulted to learn the range of productivity to be expected for this SCS range site in a relatively dry year.

Location, Soils, and Range Site

The reference area occupies a parcel of typical native range unaffected by coal operations and other ground-disturbing activities. It lies just east of the north-south fence bounding the east side of the loadout area, but is currently unfenced. A low-standard dirt road passes just below (within 40 feet of) the area, affording easy access but not otherwise affecting it. The legal location is the NW 1/4 of the SE 1/4 of section 33, township 13 south, range 9 east, Salt Lake Base and Meridian (see Plate 1 of Mining and Reclamation Plan).

As currently marked, the reference area is rectangular, 300 by 160 feet, with the short sides perpendicular to the contour. The area's size is thus about 48,000 square feet, or 1.10 acre. All observations and sampling were confined to this tract, but the resultant estimates and descriptions apply (except for the drainageway to the north and the disturbed area to the west) to the land encircling this perimeter.

The terrain is convex, faces east-southeast, and has two small, non-incised gullies. The elevation is approximately 6170 feet, with only a 10 to 12-foot difference from the top to the bottom of the area. Slopes range from nearly level to about 8%.

The soil underlying the site belongs to the Hernandez family (Jensen and Borchert, 1988, page 294), and is a fine-loamy, mixed, mesic, Ustollic Calciorthid. The map unit, 52 (sheet 8 of the soil survey), is in the Semidesert Loam (Wyoming Big Sagebrush) range site. This unit extends well beyond the reference area, signifying that the area, while small, is not atypical of the surrounding soils. The Hernandez soil family and its capabilities are described in detail in the new survey (Jensen and Borchert, 1988), especially on page 45. The geology is alluvim mainly derived from sandstone and shale.

The natural vegetation that typifies the Hernandez soil corresponds very strongly to that currently occupying the reference area.

Land Use and Animal Influences

Although unaffected by coal operations, the reference area is grazed and browsed by cattle, sheep, and mule deer, with most use occuring in fall and winter. Cattle use, judged by manure, ground conditions, and plant composition, is probably very light or incidental, whereas signs of sheep and deer use are considerably more evident. Both sheep and deer pellets are abundant, and two Utah juniper just off the area were severely "high-lined" by wintering deer. However, there are no bed grounds or any other sign of unusual livestock or deer concentrations, such as severe browsing, patches of weed, or devegetated ground.

No vegetation or land treatments (spraying, disking, chaining) have been imposed on the area or its surroundings, nor have non-native forage plants been accidentally or deliberately established on the area.

The reference area serves as habitat for cottontail rabbits and prairie dogs. There was no evidence whatsoever of recent grasshopper depredations. Refer to page 195 of the soil survey for wildlife habitat evalutions of this soil family.

Vegetation and Surficial Conditions

The plant community is dominated by big sagebrush (Artemisia tridentata subspecies wyomingensis and tridentata) and Indian ricegrass (Oryzopsis hymenoides), both common, native species. Subordinate species include galleta (Hilaria jamesii), winterfat (Eurotia lanata), pricklypear (Opuntia sp.), low rabbitbrush (Chrysothamnus viscidiflorus), downy brome (Bromus tectorum), and needleandthread (Stipa comata). Other, much less abundant species and genera noted in the area were:

Trees and shrubs:

Juniperus osteosperma (Utah juniper) -- one sapling, 4.5' high
Pinus edulis (Two-needle pinyon) -- one seedling

Forbs:

Descurainia sp. (Tansymustard)
Plantago sp. (Wooly indianwheat)
Machaeranthera sp.
Oysterplant (Tragopogon sp.) -- two plants

Grasses:

Sitanion hystrix (bottlebrush squirreltail)
Crested wheatgrass (Agropyron cristatum) -- one plant

These minor species would not be encountered during normal sampling intensities, are of little importance in the plant community, and show no

signs of increasing. Furthermore, not all of them would necessarily be found on an equivalent-sized area of this rangeland type, whether natural or reclaimed. Both pinyon and juniper trees grow close to the reference area, but are not invading it.

Specimens of most species were collected, and some identifications were made with the assistance of the USU Extension Range Management Specialist. After a close search, no extraordinary plant taxa were observed within the area or around its perimeter, so a negative declaration regarding T & E species is warranted. The Gordon Creek/Wildcat Canyon area is not a known locality for endemic or unusual plants.

Much of the soil surface is bare, but there are no signs of accelerated erosion nor of deposition of soil fines from the adjacent coal area. Thin traces of coal dust have been deposited on the surface, but their occurrence is very slight. Moderate sheetwash is the only apparent influence on the surface; neither rilling, pronounced pedestaling of shrubs, nor incipient gullying are evident. At the same time, seasonal crusting of the soil may limit establishment of new plants, and there is no microphytic (mosses, algae, and lichens) soil crust whatsoever.

Vegetation Cover and Shrub Density

Fifteen (15) 40-foot (13 m) transects were established throughout the area to estimate cover by line interception (Canfield 1941). Random numbers (Steel and Torrie 1980) were used to determine x-y coordinates and transect orientation. Other work had shown that this sampling intensity (about 100 m of line per acre) would yield reasonably precise estimates of the major cover forms. The following results were obtained:

	Percent Cover		
Form & Species	Mean	Std. Deviation	80% Confidence Interval
Ground Surface			
Bare ground	68.1	10.5	64.5 - 71.8
Litter	10.2	6.5	8.0 - 12.4
Shrubs			
Sagebrush	8.7	6.9	6.3 - 11.1
Winterfat	0.7	1.1	0.3 - 1.1
Rabbitbrush	0.5	0.9	0.2 - 0.8
Grasses			
Indian ricegrass	3.5	2.9	2.5 - 4.5
Galleta	6.2	11.0	2.4 - 10.1
Downy brome	0.5	1.8	-0.1 - 1.1
Needleandthread	0.6	0.9	0.3 - 0.9
Other			
Pricklypear	0.2	0.5	0.1 - 0.4

20.9

The two subspecies of sagebrush apparently present (Wyoming and basin) were not distinguished during sampling. The former seems to occupy slightly shallower soils on the interfluves, in a nearly monotypic stand, whereas the latter grows taller and in closer association with other species. However, there is little basis for demarcating two different shrub communities.

Shrub (woody plant) density was estimated with the point-centered quarter method (Cottam and Curtis, 1956; DOGM, 1982), using seventy (70) randomly placed points and measuring distance to plant stems to the nearest inch. The combined density of sagebrush (all sizes, both apparent species), winterfat, and rabbitbrush was estimated as 5,384 plants/acre (80% confidence interval of 4,094 to 7,862 plants/acre).

A supplemental (non-required) measurement taken to help describe the community and its "relative maturity" was a large sample of mature sagebrush heights:

Sample Size	Mean Height (")	St. Dev.	80% Confidence Interval
90	24.7	12.0	24.0" - 25.3"

Thus, the dominant sagebrush plants vary little in height. Very few displayed inflorescences, a possible consequence of browsing pressure. However, sagebrush seedlings are easily abundant enough to ensure perpetuation of the stand for the foreseeable future. Overall, the reference area supports a multi-sized, multi-aged sagebrush component. Although there are a few dozen dead sagebrush crowns, by no means is the stand declining or decadent. Combined cover of shrubs does not surpass 20%, but the area should be classed as "shrubland" (West 1983).

No productivity estimates were obtained, as they were not required and the cool-season grasses were well past maturity whereas the galleta had not headed out in response to summer rains. The SCS (Jensen and Borchert, 1988, page 166) states that 500 lb/acre of dry weight forage can be expected in an "unfavorable" year from this range site. At the time of sampling, certainly no more than this was available from all species, and production of palatable grasses on the area would not have exceeded 250 lb/acre. Depending on the class of livestock or big game using the area, its condition would be rated between "fair" and "good" -- certainly neither "poor" nor "excellent". The trend, as judged by the lack of tree invasion, grass reproduction, and the quantity and vigor of winterfat plants, is at least stable or slightly upward. Both sagebrush reproductive effort and winterfat numbers might increase after fencing.

In conclusion, the reference area appears to meet important criteria of representativeness, current range condition, typical levels of production, and lack of exogenous disturbances from the loadout operation or other cultural activities. There are no signs whatever of imminent or long-term change away from its current appearance and composition.

References and Background Literature

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5. Jensen, E. H., and J. W. Borchert. 1988. Soil survey of Carbon Area, Utah. USDA Soil Conservation Service in cooperation with USDI Bureau of Land Management and Utah Agricultural Experiment Station. 294 pages + maps.

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11. West, N. E. 1983. Great Basin-Colorado Plateau sagebrush semi-desert. Chapter 12 (pages 331-349) in N.E. West, editor Temperate Deserts and Semi-Deserts. Elsevier Publishing Company, Amsterdam.

10/14/88

Wednesday, October 12, 1988
Logan, Utah

Mr. Michael Glasson
Tower Division
Andalex Resources, Inc.
P. O. Box 902
Price, Utah 84501

Dear Mike:

As you requested earlier this morning, here are the field data sheets I retained from the August work at the Wildcat loadout reference area. The Division of Oil, Gas, and Mining guidelines do state that the consultant should be prepared to submit copies of the data sheets used in the field. I am happy to do so, and I apologize for not thinking of this earlier when I sent the report.

After your call, I took the time to write out and attach explanatory notes to the field forms, which are otherwise unedited and might be hard for a reader to understand. I have also tried to remedy any legibility problems possibly caused by my back problem on the day of the visit. I did not keep verbal field notes nor plant voucher specimens past the week in September when I said I was available for a followup visit; those were discarded in connection with a general cleanup of outdated files and specimens at the lab where I work.

You may wish to retain a photocopy of the sheets while sending the originals on to the state, with or without this letter. If I need to stop by Price in the near future, call me at 750-2471 and I'll get in touch with you about an early November date -- I'll be going through Price enroute to Moab, probably on the 7th.

Thank you.

Sincerely yours,

Nick Van Pelt

Nicholas Van Pelt

Attachments

October 12, 1988

Explanatory notes to accompany field data sheets and computer printouts --- in connection with Nicholas Van Pelt's report to Andalex Resources concerning the small Wildcat loadout reference area, mid-August, 1988.

Overall:

1. The two required estimates were for ground-surface and plant species cover, and for density of the major shrubs. The respective techniques used were line-intercept ("LI") and point-centered-quarter method ("PCQM").

2. For sample locations, I used coordinates generated from a random-numbers table in a standard statistics book (see photocopy). This is standard procedure, in preference to spacing line ends or plot centers systematically (for example, every 5 meters or 3 yards) or subjectively (choosing the placements to be "representative" or "typical").

3. Printouts are from MINITAB statistical package runs.

Refer to explanations attached to the sheets for the particular analysis.

(Example)

TABLE A–15 Table of random digits

Line	(1)-(5)	(6)-(10)	(11)-(15)	(16)-(20)	(21)-(25)	(26)-(30)	(31)-(35)
101	13284	16834	74151	92027	24670	36665	00770
102	21224	00370	30420	03883	94648	89428	41583
103	99052	47887	81085	64933	66279	80432	65793
104	00199	50993	98603	38452	87890	94624	69721
105	60578	06483	28733	37867	07936	98710	98539
106	91240	18312	17441	01929	18163	69201	31211
107	97458	14229	12063	59611	32249	90466	33216
108	35249	38646	34475	72417	60514	69257	12489
109	38980	46600	11759	11900	46743	27860	77940
110	10750	52745	38749	87365	58959	53731	89295
111	36247	27850	73958	20673	37800	63835	71051
112	70994	66986	99744	72438	01174	42159	11392
113	99638	94702	11463	18148	81386	80431	90628
114	72055	15774	43857	99805	10419	76939	25993
115	24038	65541	85788	55835	38835	59399	13790
116	74976	14631	35908	28221	39470	91548	12854
117	35553	71628	70189	26436	63407	91178	90348
118	35676	12797	51434	82976	42010	26344	92920
119	74815	67523	72985	23183	02446	63594	98924
120	45246	88048	65173	50989	91060	89894	36036
121	76509	47069	86378	41797	11910	49672	88575
122	19689	90332	04315	21358	97248	11188	39062
123	42751	35318	97513	61537	54955	08159	00337
124	11946	22681	45045	13964	57517	59419	58045
125	96518	48688	20996	11090	48396	57177	83867
126	35726	58643	76869	84622	39098	36083	72505
127	39737	42750	48968	70536	84864	64952	38404
128	97025	66492	56177	04049	80312	48028	26408
129	62814	08075	09788	56350	76787	51591	54509
130	25578	22950	15227	83291	41737	59599	96191
131	68763	69576	88991	49662	46704	63362	56625
132	17900	00813	64361	60725	88974	61005	99709
133	71944	60227	63551	71109	05624	43836	58254
134	54684	93691	85132	64399	29182	44324	14491
135	25946	27623	11258	65204	52832	50880	22273
136	01353	39318	44961	44972	91766	90262	56073
137	99083	88191	27662	99113	57174	35571	99884
138	52021	45406	37945	75234	24327	86978	22644
139	78755	47744	43776	83098	03225	14281	83637
140	25282	69106	59180	16257	22810	43609	12224
141	11959	94202	02743	86847	79725	51811	12998
142	11644	13792	98190	01424	30078	28197	55583
143	06307	97912	68110	59812	95448	43244	31262
144	76285	75714	89585	99296	52640	46518	55486
145	55322	07598	39600	60866	63007	20007	66819
146	78017	90928	90220	92503	83375	26986	74399
147	44768	43342	20696	26331	43140	69744	82928
148	25100	19336	14605	86603	51680	97678	24261
149	83612	46623	62876	85197	07824	91392	58317
150	41347	81666	82961	60413	71020	83658	02415

Source: *Table of 105,000 Random Decimal Digits*, Interstate Commerce Commission, Bureau of Transport Economics and Statistics, 1949.

Line-intercept field sheets and computer printout (first stapled set).

There is no standard field sheet that I know of for recording line-intercept data. The sheets used here show a species or ground-cover category (see explanation of abbreviations, below) on the left and right sides, with new categories added as encountered. Each division, of the 80 total, represents one-half meter. The cover estimated along the tape for each species or other form of cover is represented by the penciled line segments. The total length of the segments for each cover category was added up, and then converted to percentages of the total line length (40 meters) for that transect. The percentages for each cover category for all transects were next entered into a computer data file, and the statistics shown were readily generated. All the means should add up to virtually 100.00 percent; in this instance, the total (C1 through C10) was 99.39%.

Abbreviations	Species or Other Category	Printout Code
"bg"	bare ground	C1
"ltr"	plant litter	C2
"At"	Artemisia tridentata	C3
"ukg"	Unknown grass, later identified as galleta	C4
"Orhy"	Oryzopsis hymenoides	C5
"Cela"	Ceratoides lanata	C6
"Chry"	Chrysothamnus spp.	C7
"Cact"	Cactus, later identified as Opuntia sp.	C8
"Brte"	Bromus tectorum	C9
"Stco"	Stipa comata	C10

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PP             JJ      JJ           SS       YY      NN      NN
PP               JJJJJJ    SSSSSSSS          YY      NN      NN
PP               JJJJJJ    SSSSSSSS          YY      NN      NN

     L        III     SSSS  TTTTT   AAA   TTTTT   SSSS
     L         I    S         T    A   A    T    S
     L         I    S         T    A   A    T    S
     L         I     SSS      T    A   A    T     SSS
     L         I         S    T    AAAAA    T         S
     L         I         S    T    A   A    T         S
     LLLLL    III   SSSS      T    A   A    T    SSSS


      J   OOO   BBBB           1    7777    999   7777
      J  O   O  B   B         11       7   9   9     7
      J  O   O  B   B          1       7   9   9     7
      J  O   O  BBBB           1      7     9999    7
  J   J  O   O  B   B          1     7         9   7
  J   J  O   O  B   B          1    7          9  7
   JJJ    OOO   BBBB         111   7        999   7
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Job LISTATS (1797) queued to PRX_NR213 on 16-AUG-1988 22:22 by user PJSYN, UIC [PJSYN], under account 540002 at priority 100, started on printer _USU$TXJ6: on 16-AUG-1988 22:22 from queue PRX_NR213.

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5555555555555555555555555555555555555  Digital Equipment Corporation - VAX/VMS Version V4.5  5555555555555555555555555555555555555555
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line intercepts

MTB > TINTERVAL WITH 80 PERCENT CONFIDENCE FOR DATA IN C1-C10

	N	MEAN	STDEV	SE MEAN	80.0 PERCENT C.I.
C1	15	68.13	10.53	2.72	(64.47, 71.79)
C2	15	10.20	6.46	1.67	(7.96, 12.44)
C3	15	8.73	6.86	1.77	(6.35, 11.12)
C4	15	6.27	11.06	2.86	(2.42, 10.11)
C5	15	3.533	2.900	0.749	(2.526, 4.541)
C6	15	0.733	1.163	0.300	(0.329, 1.137)
C7	15	0.467	0.915	0.236	(0.149, 0.785)
C8	15	0.200	0.561	0.145	(0.005, 0.395)
C9	15	0.533	1.807	0.467	(-0.094, 1.161)
C10	15	0.600	0.910	0.235	(0.284, 0.916)

MTB > READ 'WILDCAT.HTS' C1

```
PP          JJ       JJ              SS          YY       NN       NN
PP            JJJJJJ      SSSSSSSS               YY       NN       NN
PP            JJJJJJ      SSSSSSSS               YY       NN       NN

H   H  EEEEE   III   GGGG  H   H  TTTTT   SSSS
H   H  E        I   G      H   H    T    S
H   H  E        I   G      H   H    T    S
HHHHH  EEEE     I   G      HHHHH    T     SSS
H   H  E        I   G GGG  H   H    T        S
H   H  E        I   G   G  H   H    T        S
H   H  EEEEE   III   GGG   H   H    T    SSSS

    J   OOO   BBBB           1   7777    999    888
    J  O   O  B   B         11      7   9   9  8   8
    J  O   O  B   B          1      7   9   9  8   8
    J  O   O  BBBB           1     7     9999   888
J   J  O   O  B   B          1    7         9  8   8
J   J  O   O  B   B          1   7          9  8   8
 JJJ    OOO   BBBB          111  7       999    888
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Job HEIGHTS (1798) queued to PRX_NR213 on 16-AUG-1988 22:23 by user PJSYN, UIC [PJSYN], under account 540002 at priority 100, started on printer _USU$TXJ6: on 16-AUG-1988 22:23 from queue PRX_NR213.

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Artr heights

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MTB > TINTERVAL WITH 80 PERCENT CONFIDENCE FOR HTS IN C1

              N      MEAN    STDEV   SE MEAN    80.0 PERCENT C.I.
C1           90     62.74    12.00      1.27   (   61.11,    64.38)

MTB > READ 'MAP.ART' C1
     70 ROWS READ

C1
     3.2       2.2       1.2       1.5    .    .    .

MTB > OUTFILE 'ART.CVR'
```
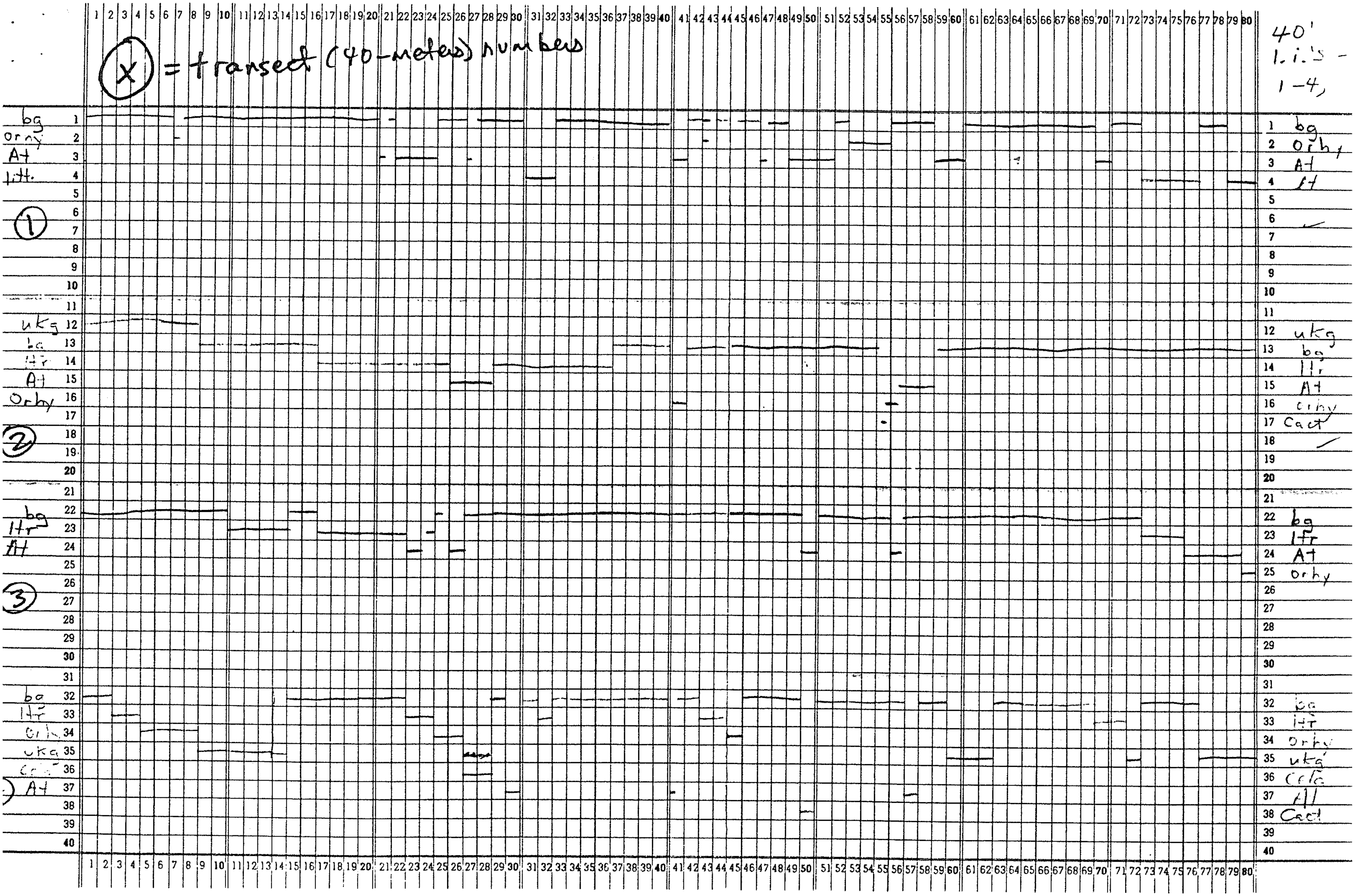
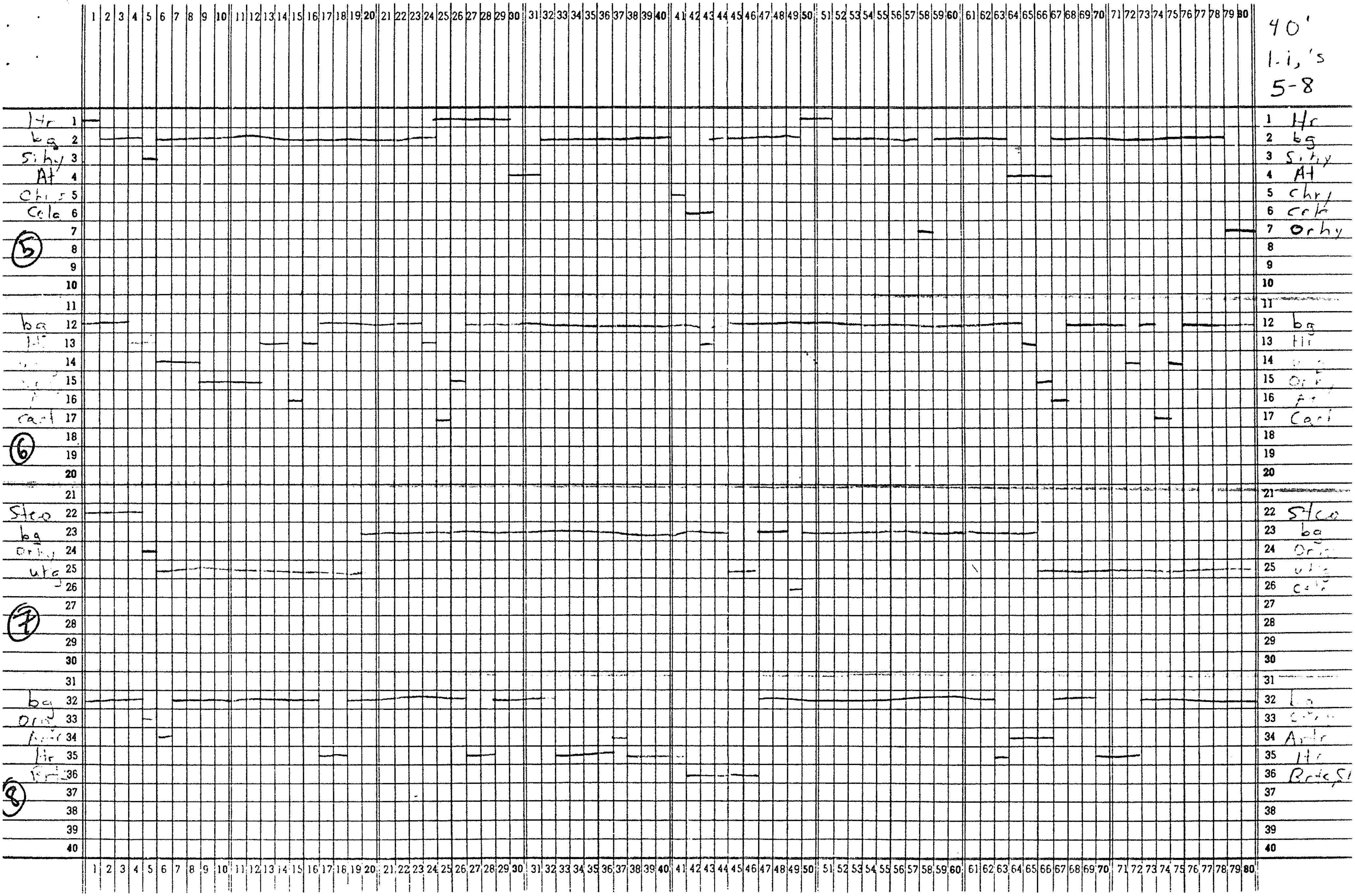

24.7" average; (24.0" – 25.3")



(X) = transect (40-meters) numbers
40'
l.i.'s -
1-4,
bg
orhy
At
litt.
(1)
ukg
bg
lfr
At
Orhy
(2)
bg
lfr
At
(3)
bg
lfr
orhy
ukg
Crla
At
Cact

40'
l.i.'s
5-8


Hr
bg
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5
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Hr
Cal
Carl
6
Stco
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Orhy
utg
7
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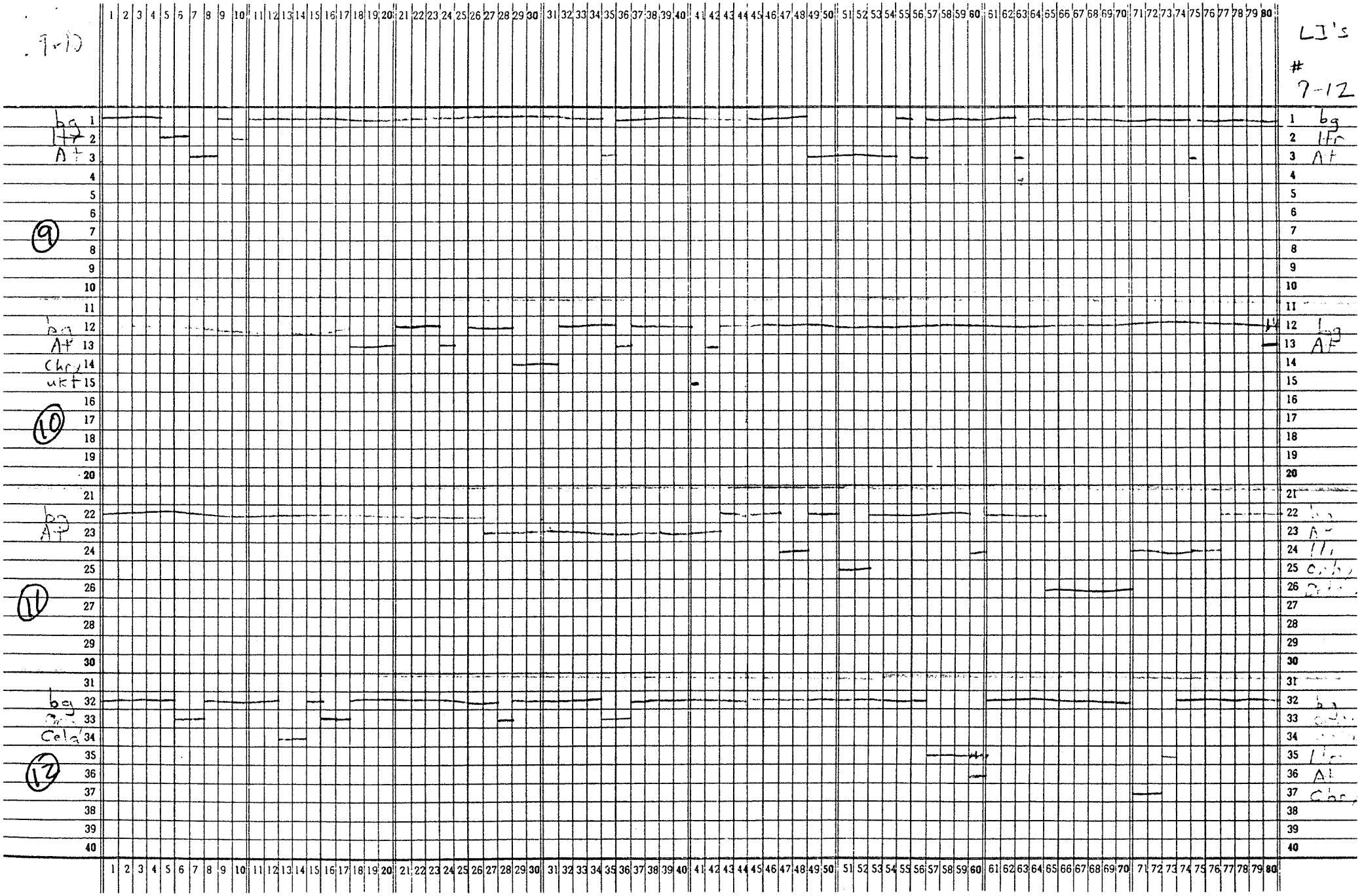
Orhy
Antr
Hr
Brtc,Sl
8


7-11
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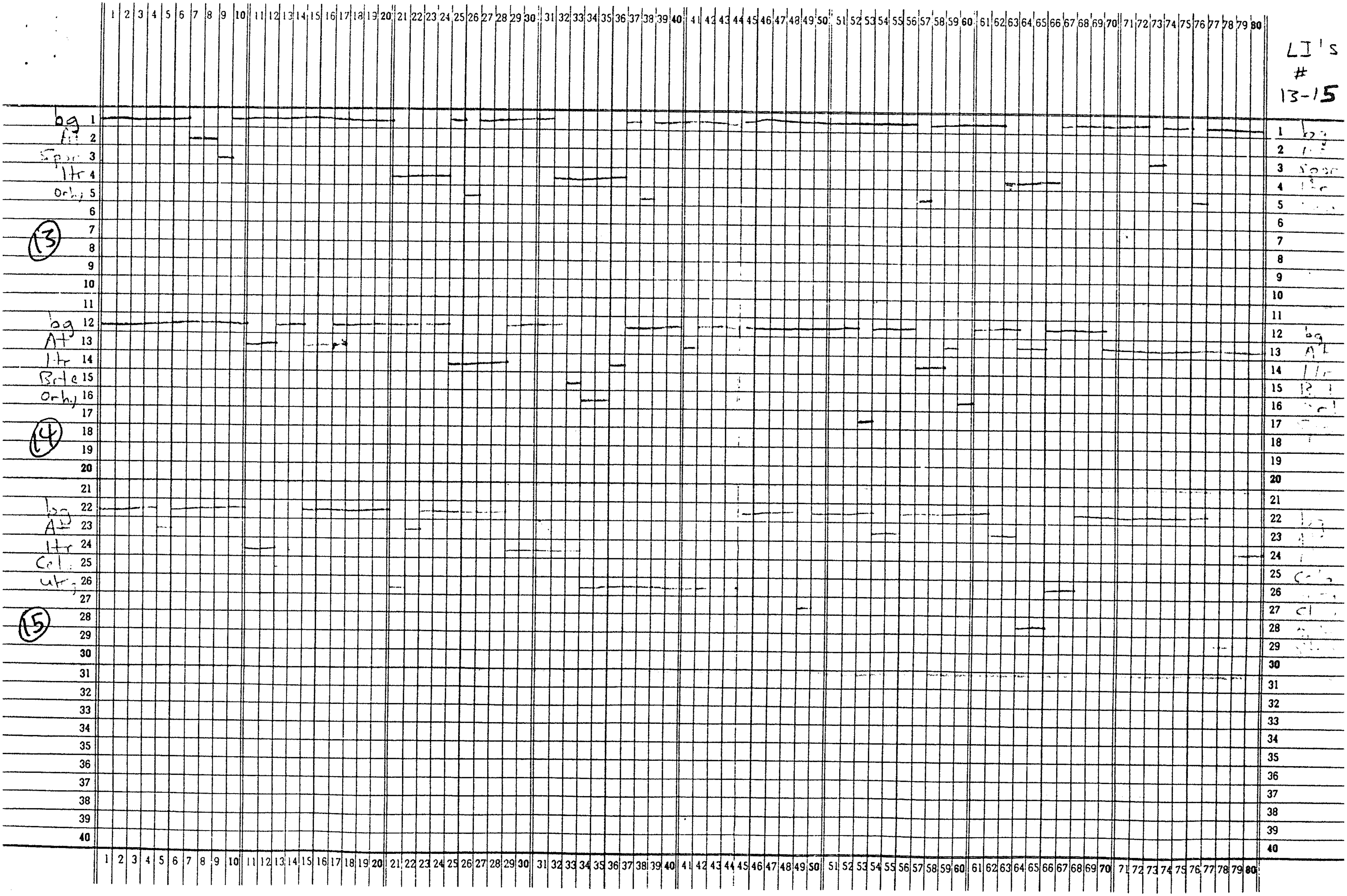

Density of the most prominent shrub species (second stapled set).

Once a random point had been located via coordinates, four 90-degree quadrants were established with a round sampling ring having four spokes, again with the divisions among them determined randomly (for example, compass bearing of 136 degrees as determining the dividing line between the upper left and upper right quadrants). On the data sheets, the quadrants were coded as follows:

"UL" means upper left

"UR" means upper right

"LR" means lower left

"LL" means lower left

Distances to the nearest plant of the species in that quadrant were recorded in the appropriate column. "At" means Artemisia (sagebrush species), "Cela" means Ceratoides lanata (winterfat) above the column for averages. For each point, "MAP" means mean area per plant, subsequently used (per the grand mean; see printouts) in the formula supplied in the DOGM guidelines. Note that winterfat were so sparse that they only occurred within a reasonable distance of the point in 10 of the samples, whereas sagebrush were within about 116" (about 10 feet) in all samples.

nearly

Estimation of mean heights of mature sagebrush -- optional measure (final sheet, not stapled).

Computer printout; I do not have the field sheet.

```
PP            JJ       JJ              SS       YY       NN       NN
PP              JJJJJJ      SSSSSSSS            YY       NN       NN
PP              JJJJJJ      SSSSSSSS            YY       NN       NN

                        AAA    RRRR    TTTTT
                       A   A   R   R     T
                       A   A   R   R     T
                       A   A   RRRR      T
                       AAAAA   R R       T
                       A   A   R  R      T
                       A   A   R   R     T

      J    OOO    BBBB          1      7777     999    55555
      J   O   O   B   B        11         7    9   9   5
      J   O   O   B   B         1         7    9   9   555
      J   O   O   BBBB          1        7      9999      5
  J   J   O   O   B   B         1       7          9      5
  J   J   O   O   B   B         1      7           9   5  5
   JJJ     OOO    BBBB         111     7         999    555
```

Job ART (1795) queued to PRX_NR213 on 16-AUG-1988 22:21 by user PJSYN, UIC [PJSYN], under account 540002 at priority 100, started on printer _USU$TXJ6: on 16-AUG-1988 22:21 from queue PRX_NR213.

```
3333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333
333333333333333333333333333333333333  Digital Equipment Corporation - VAX/VMS Version V4.5  33333333333333333333333333333333333
3333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333
```

density

5,384.4 plants/ac - combined
(4099.0 - 7862.8)

```
MTB > TINTERVAL WITH 80 PERCENT CONFIDENCE FOR MAP IN C1

            N      MEAN     STDEV   SE MEAN    80.0 PERCENT C.I.
C1         70      8.09     16.49      1.97   (    5.54,    10.64)

MTB > TINTERVAL WITH 95 PERCENT CONFIDENCE FOR MAP IN C1

            N      MEAN     STDEV   SE MEAN    95.0 PERCENT C.I.
C1         70      8.09     16.49      1.97   (    4.15,    12.02)

MTB >
MTB > READ 'MAP.ELA' C1
     10 ROWS READ

C1
```

```
PP          JJ      JJ          SS      YY      NN      NN
PP            JJJJJJ    SSSSSSSS        YY      NN      NN
PP            JJJJJJ    SSSSSSSS        YY      NN      NN

                     EEEEE  L       AAA
                     E      L      A   A
                     E      L      A   A
                     EEEE   L      A   A
                     E      L      AAAAA
                     E      L      A   A
                     EEEEE  LLLLL  A   A


         J   OOO   BBBB          1    7777   999   666
         J  O   O  B   B        11       7  9   9  6
         J  O   O  B   B         1       7  9   9  6
         J  O   O  BBBB          1      7    9999  6666
     J   J  O   O  B   B         1     7        9  6   6
     J   J  O   O  B   B         1    7         9  6   6
      JJJ    OOO   BBBB         111   7      999    666
```

Job ELA (1796) queued to PRX_NR213 on 16-AUG-1988 22:21 by user PJSYN, UIC [PJSYN], under account 540002 at priority 100, started on printer _USU$TXJ6: on 16-AUG-1988 22:21 from queue PRX_NR213.

```
4444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444
444444444444444444444444444444444444  Digital Equipment Corporation - VAX/VMS Version V4.5  444444444444444444444444444444444444444
4444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444444
```

mean density: 730.8

```
MTB > TINTERVAL WITH 80 PERCENT CONFIDENCE FOR DATA IN C1

               N      MEAN     STDEV  SE MEAN    80.0 PERCENT C.I.
C1            10      5.96      4.50     1.42  (     3.99,     7.93)

MTB > STOP
*** Minitab Release 6.1.1 *** Minitab, Inc. ***
Storage available 842925
```

PC Q. p.3

	UL	UR	LR	LL	At Aj X̄	cela Aj	At MAP	cela MAP
1	3	4	16	9	.7		.5	
2	6	2	13	10	[illegible]		.4	
3	12	24	27	30	1.7		3.6	
4	21	41	39	79	.7		13.7	
5	15	77	71	79	[illegible]		25.0	
6	11	65	17	17	[illegible]		5.3	
7	5	7	10	12	.7		.5	
8	10	27	8	35	1.1		2.9	
9	17	20	12	22	[illegible]		2.3	
10	12	11	12	12	1.1		1.0	
11	16	4	17	9	1.0		1.0	
12	13	46	49	7	[illegible]		5.8	
13	60	16	58	43	[illegible]		13.7	
14	22	20	39	13	[illegible]		4.0	
15	4	6	6	5	[illegible]		.2	
16	14	9	27	17	1.4		2.0	
17	29	40	63	32	[illegible]		11.5	
18	116	59	72	25	[illegible]		31.3	
19	53	26	52	30	[illegible]		10.9	
20	19	46	112	45	[illegible]	3.7	24.0	13.
21	25	144	137	55	2.0	3.8	[illegible]4.0	14.
22	60	16	13	20	2.3		5.3	
23	5	8	6	15	.7		.5	
24	19	16	12	23	1.4		2.0	
25	21	30	37	27	2.4		5.8	
26	10	29	20	50	2.3		5.3	
27	19	15	13	6	.9	1.6	.8	2.
28	4	1	6	18	.6		.4	
29	32	16	14	18	1.7		3.9	
30	2	5	16	5	.6		.4	

PCQM

P 1 - ☐ = Calc

UL	UR	LR	LL	At/Aj	Aj Calc	At MAP		
19	7	19	42	1.8		3.2	1	(randomly
18	12	36	6	1.5		2.2	2	located
13	2	20	17	1.1		1.2	3	within
13	22	13	11	1.2		1.5	4	the stand
25	21	10	10	1.1	[illegible].1	1.2	5	4.4
21	16	17	33	1.8		3.2	6	
23	6	4	26	1.[illegible]		1.4	7	
17	8	6	9	.8		.6	8	
25	56	13	16	[illegible]		5.3	9	
12	12	19	5	1.0		1.0	10	
48	33	45	31	5.3		10.9	11	
33	12	29	39	2.[illegible]		4.8	12	
150	52	39	38	6.4		41.0	13	
30	15	10	37	1.4	1.[illegible]	3.6	14	3.6
26	31	57	28	[illegible]	[illegible]	10.2	15	5.3
19	38	14	27	2.[illegible]		4.0	16	
[illegible]	12	57	33	[illegible]		6.2	17	
53	45	55	10	[illegible].4		5.5	18	
58	21	26	14	2.7	1.[illegible]	7.3	19	2.9
103	32	35	105	[illegible]	[illegible].1	75.7	20	7.3
30	47	51	35	3.4		11.6	21	
24	57	25	64	10.4	[illegible]	108.2	22	4.0
44	39	47	17	[illegible].1		9.6	23	
52	27	24	21	[illegible]	1.[illegible]	8.4	24	2.9
9	16	25	34	1.[illegible]		2.9	25	
10	27	10	8	1.1		1.2	26	
26	10	11	5	1.[illegible]		1.2	27	
25	33	35	28	[illegible]		6.3	28	
23	73	68	40	4.[illegible]		17.6	29	
24	7	38	25	[illegible]		3.6	30	
12	28	33	32	[illegible]		4.8	31	
3	25	21	20	1.4		1.9	32	
4	5	4	3	.[illegible]		.09	33	
5	11	5	12	[illegible]		.5	34	
15	4	10	15	[illegible]		.8	35	
4	4	6	8	.4		.2	36	
11	9	4	18	[illegible]		.6	37	
4	29	15	13	1.[illegible]		1.6	38	
33	29	4	34	[illegible].1		4.4	39	
20	31	20	27	1.6	1.7	2.6	40	2.9